



# ***AISG Extension: Geographic Location Sensor***

## ***Geographic Location Sensor Extension to the Control Interface for Antenna Line Devices***

*Extension to AISG version 2.0*

### **Revision History**

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## 1. FOREWORD

The Antenna Interface Standards Group (AISG) published the AISG standard to facilitate the introduction of antenna line products with remote control and monitoring facilities. The purpose of that standard is to ensure basic interoperability of antennas and control infrastructure. The AISG standard covers two basic types of Antenna Line Devices: Actuators capable of altering the electrical downtilt of the antenna and tower mounted amplifiers.

It has become evident that commercial antenna line devices are evolving beyond this set of capabilities. The AISG has decided to publish extensions to the basic standard rather than adding all possible branches to the core specification. For purposes of compliance, users should note that this entire Extension Standard is *optional*. However, once a given Extension Standard is elected for inclusion in a device, the entire option becomes mandatory.

This extension to the AISG standard adds procedures for antenna line devices that detect and/or store and then report geographic location information. Detecting, storing and reporting the location of an antenna can occur with varying levels of precision as required by the user, and as the underlying technology permits. One immediately apparent application is to confirm that a remotely configured antenna is mounted on the correct tower in the intended sector position.

## 2. SCOPE

This document contains extensions to layers 2 and 7 of AISG specification, version 2.0 [1], for Antenna Line Devices implementing Geographic Location Sensor (GLS).

## 3. REFERENCES

This AISG standard incorporates provisions from other publications. These are cited in the text and the referenced publications are listed below. Where references are dated, subsequent amendments or revisions of these publications apply only when specifically incorporated by amendment or revision of this AISG extension. For undated references the latest edition of the publication referred to applies.

- 1 AISG Version 2.0, "Control Interface for Antenna Line Devices"
- 2 3GPP TS25.460 UTRAN Iu-nt Interface General Aspects and Principles Release 6
- 3 3GPP TS25.461 UTRAN Iu-nt Interface Layer 1, Release 6
- 4 3GPP TS25.462 UTRAN Iu-nt Interface Signalling Transport, Release 6
- 5 3GPP TS25.463 UTRAN Iu-nt Interface: Application Part, Release 6
- 6 [Not used]
- 7 NIMA TR8350.2 U.S. Department of Defense World Geodetic System 1984, Third Edition - Amendment 1
- 8 AISG-ES-ACS v2.1.1 AISG Extension Specification: ACS



Note the 3GPP references are to Release 6 unless otherwise indicated. These documents are referred to in AISG Version 2.0, although they may have been superseded.

## 4. ABBREVIATIONS

Where abbreviations or acronyms are used in this document they have the following meanings:

GLS	Geographic Location Sensor
TCP	Time Consuming Procedure
WGS	World Geodetic System

## 5. TERMINOLOGY AND DEFINITIONS

Where the following terms are used in this document, they have the meanings listed below.

Latitude	An angular measurement in degrees ranging from 0 degrees at the equator, to +90 degrees at the North pole, and -90 degrees at the South pole, as specified by WGS84 [7]. Latitude identifies a position on earth north or south of the equator and is reported in decimal degrees, to six decimal places of accuracy, and then multiplied by $1 \times 10^6$ so that it may be represented by an integer.
Longitude	An angular measurement ranging from 0 degrees at the prime meridian (Greenwich meridian) to +180 degrees eastward and -180 degrees westward, as specified by the WGS84 [7] ellipsoid. Longitude identifies a position on earth east or west of the prime meridian and is reported in decimal degrees, to six decimal places of accuracy, and then multiplied by $1 \times 10^6$ so that it may be represented by an integer.
Altitude	The elevation of a point or object from the surface of the WGS84 [7] geoid. Altitude is reported in meters, to one decimal place of accuracy, and then multiplied by 10 so that it may be represented by an integer.
Calculated Location	Coordinates representing the 'best estimate' of the GLS in two dimensions (latitude and longitude). This value may be the result of averaging historical data, or any other means of calculation deemed appropriate by the GLS vendor for producing a consistently accurate result.
Calculated Altitude	A value representing the 'best estimate' of the GLS in the altitude dimension. This value may be the result of averaging historical data, or any other means of calculation deemed



appropriate by the GLS vendor for producing a consistently accurate result.

Location Precision

A value that represents the standard deviation of values from their arithmetic mean in one of the three dimensions measured by the GLS (latitude, longitude, altitude). This value may be used to judge the credibility of calculated measurements. Precision is reported in meters, to one decimal place of accuracy, and then multiplied by 10 so that it may be represented by an integer.



## **6. LAYER 1**

All definitions and specifications for RET devices in the reference [1], [2] and [3] regarding layer 1 apply to GLS devices complying with this Extension Standard unless otherwise stated by requirements in this document.

### **6.1. DC supply**

#### **6.1.1. GLS DC power consumption**

Power consumption shall be given by the product data sheet.

#### **6.1.2. GLS Power-up characteristics**

Devices complying with this Extension Standard shall have a maximum power-up period of 3 seconds.

After the power-up period, the device shall be fully functional.

### **6.2. Resumption of operation after interruption of supply**

Normal operation shall be resumed after restoration of the power supply after any interruption or arbitrary reduction of the voltage supplied (brown-out) in accordance with [3].

NOTE: Location information may not be immediately available.

#### **6.2.1. GLSs**

No data shall be retained by the GLS.



## **7. LAYER 2**

All definitions and specifications for RET devices in reference [4] regarding layer 2 shall be valid for all antenna line devices included in this Extension Standard regardless of whether the device implements RET functionality.

Extended specifications for layer 2 are defined in the following chapter.

### **7.1. Device Type**

For the purposes of reverse compliance with [4], devices implementing this Extension Standard shall report the device type in compliance with provisions in [5].

The following table shows the additional device type for this Extension Standard:

**Table 7.1.1: Device type**

<b>Device Type</b>	<b>1-octet hexadecimal code</b>
Geographic Location Sensor	0x25



## 8. LAYER 7

The application layer includes the common elementary procedures as defined in [1] and [5] and is extended by AISG-specific procedures.

### 8.1. General Aspects

#### 8.1.1. Geometry and Numbering

All GLS devices shall be defined as multiple subunit devices.

NOTE: Devices with single GLS units shall be implemented as multiple subunit devices with the number of subunits equal to 1.

#### 8.1.2. Parallel Procedure Handling for Time Consuming Procedures (TCPs)

The GLS device does not define any TCPs. Parallel procedure handling is not supported by the GLS.

### 8.2. Return and alarm codes

A table of return and alarm codes is given in [5].

### 8.3. Elementary Procedures for the Geographic Location Sensor

To avoid prematurely exhausting the available space in the command table through the proliferation of extensions, certain codes defined for other devices are reused by this extension. This process is called “overloading”.

For devices compliant with this extension, the overloaded code shall refer to a member of the GLS procedure set defined herein, and not to the procedure assigned by the original specification.

This section defines those procedures that are defined by overloading existing procedure codes without any significant changes in the procedure initiation message, response message, and/or return code values. For clarity, only differences from the language of the referenced specification are elaborated for these procedures.

**Table 8.3.1 Common elementary procedures**

GLS Command	Overloads	Code Value	Requirement
GLSAlarmIndication	TMAAlarmIndication [1]	0x76	Mandatory
GLSClearActiveAlarms	TMAClearActiveAlarms [1]	0x77	Mandatory
GLSGetAlarmStatus	TMAGetAlarmStatus [1]	0x78	Mandatory
GLSGetNumberOfSubunits	TMAGetNumberOfSubunits [1]	0x79	Mandatory





These commands shall be implemented as specified in the corresponding paragraphs of [1].

**8.4. Device-Specific Elementary Procedures for GLS Subunits**

This section defines procedures that are defined by overloading existing procedures in [1] that include significant changes in the procedure message initiation, response, and/or return code values or formats. No requirements from the corresponding procedure clauses in [1] shall be inferred unless re-stated in this Extension Standard.

**Table 8.4.1 Geographic Location Sensor elementary procedures for all supported functions**

The following elementary procedures shall be included by all GLS implementations, regardless of supported functions.

<b>GLS Command</b>	<b>Overloaded command</b>	<b>Code Value</b>	<b>Requirement</b>
GLSGetSupportedFunctions	TMAGetSupportedFunctions[1]	0x7A	Mandatory

**Table 8.4.2 GLS Coordinate Position function specific elementary procedures**

If the Coordinate function and the External Geographic Location Source function flags are both set, the GLS is operating as a read-only position reporting device and the GLSSetCoordinate elementary procedure is not supported.

<b>GLS Command</b>	<b>Overloaded command</b>	<b>Code Value</b>	<b>Requirement</b>
GLSSetCoordinate		0xAA	Not Supported
GLSGetCoordinate		0xAB	Mandatory

If the Coordinate function flag is set and the External Geographic Location Source function flag is cleared, the GLS is operating as a position storage device which is only updated with the GLSSetCoordinate elementary procedure.

<b>GLS Command</b>	<b>Overloaded command</b>	<b>Code Value</b>	<b>Requirement</b>
GLSSetCoordinate		0xAA	Mandatory
GLSGetCoordinate		0xAB	Mandatory



**Table 8.4.3 GLS Altitude function specific elementary procedures**

If the Altitude function and the External Geographic Location Source function flags are both set, the GLS is operating as a read-only altitude reporting device and the GLSSetAltitude elementary procedure is not supported.

GLS Command	Overloaded command	Code Value	Requirement
GLSSetAltitude		0xAC	Not Supported
GLSGetAltitude		0xAD	Mandatory

If the Altitude function flag is set and the External Geographic Location Source function flag is cleared, the GLS is operating as an altitude storage device which is only updated with the GLSSetAltitude elementary procedure.

GLS Command	Overloaded command	Code Value	Requirement
GLSSetAltitude		0xAC	Mandatory
GLSGetAltitude		0xAD	Mandatory



### 8.4.1. GLS Set Coordinate

**Table 8.4.1.1: Elementary procedure GLSSetCoordinate**

Name: <b>GLSSetCoordinate</b>				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
<b>0xAA</b>	<b>Primary device</b>	<b>1</b>	<b>No</b>	<b>Low</b>

**Table 8.4.1.2: Initiating message parameters and format for GLSSetCoordinate**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	4 octets	Signed 32 bit integer	Latitude
3	4 octets	Signed 32 bit integer	Longitude

**Table 8.4.1.3: Response message parameters and format for GLSSetCoordinate**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK

**Table 8.4.1.4: Return codes for GLSSetCoordinate**

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing OutOfRange UnsupportedProcedure	See [1]



## 8.4.2. GLS Get Coordinate

**Table 8.4.2.1: Elementary procedure GLSGetCoordinate**

Name: <b>GLSGetCoordinate</b>				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
<b>0xAB</b>	<b>Primary device</b>	<b>1</b>	<b>No</b>	<b>Low</b>

**Table 8.4.2.2: Initiating message parameters and format for GLSGetCoordinate**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number

**Table 8.4.2.3: Response message parameters and format for GLSGetCoordinate**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK
3	4 octets	Signed 32 bit integer	Latitude
4	4 octets	Unsigned 32 bit integer	Latitude precision
5	4 octets	Signed 32 bit integer	Longitude
6	4 octets	Unsigned 32 bit integer	Longitude precision

**Table 8.4.2.4: Return codes for GLSGetCoordinate**

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing UnsupportedProcedure NotConfigured  NotReady	See [1]  Prerequisite data has not been set. Unable to fulfill request.  The GLS has been correctly configured, but the location is currently unavailable. The GLS is busy collecting the required data.



### 8.4.3. GLS Set Altitude

**Table 8.4.3.1: Elementary procedure GLSSetAltitude**

Name: <b>GLSSetAltitude</b>				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
<b>0xAC</b>	<b>Primary device</b>	<b>1</b>	<b>No</b>	<b>Low</b>

**Table 8.4.3.2: Initiating message parameters and format for GLSSetAltitude**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	4 octets	Signed 32 bit integer	Altitude

**Table 8.4.3.3: Response message parameters and format for GLSSetAltitude**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK

**Table 8.4.3.4: Return codes for GLSSetAltitude**

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing OutOfRange UnsupportedProcedure	See [1]



#### 8.4.4. GLS Get Altitude

**Table 8.4.4.1: Elementary procedure GLSGetAltitude**

Name: <b>GLSGetAltitude</b>				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
<b>0xAD</b>	<b>Primary device</b>	<b>1</b>	<b>No</b>	<b>Low</b>

**Table 8.4.4.2: Initiating message parameters and format for GLSGetAltitude**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number

**Table 8.4.4.3: Response message parameters and format for GLSGetAltitude**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK
3	4 octets	Signed 32 bit integer	Altitude
4	4 octets	Unsigned 32 bit integer	Altitude precision

**Table 8.4.4.4: Return codes for GLSGetAltitude**

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing UnsupportedProcedure NotConfigured  NotReady	See [1]  Prerequisite data has not been set. Unable to fulfill request.  The GLS has been correctly configured, but the altitude is currently unavailable. The GLS is busy collecting the required data.



#### 8.4.5. GLS Get Supported Functions

On receipt of the initiating message, the secondary device shall respond with the function flags and parameters indicating the supported functionality of the addressed Antenna Line Device Temperature Sensor.

**Table 8.4.5.1: Elementary procedure GLSGetSupportedFunctions**

Name: <b>GLSGetSupportedFunctions</b>				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
<b>0x7A</b>	<b>Primary device</b>	<b>1</b>	<b>No</b>	<b>Low</b>

**Table 8.4.5.2: Initiating message parameters and format for GLSGetSupportedFunctions**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number

**Table 8.4.5.3: Response message parameters and format for GLSGetSupportedFunctions**

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK
3	1 octet	Unsigned integer	Function Flags

**Table 8.4.5.4: Return codes for GLSGetSupportedFunctions**

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing	See [1]



**Table 8.4.5.5: Function Flags for GLSGetSupportedFunctions**

On receipt of the initiating message, the GLS shall respond with the function flags and parameters indicating the supported functionality of the addressed GLS unit.

Bit	7 to 3	2	1	0
Function	Spare	External Geographic Location Source	Altitude Function	Coordinate Function

Bits are numbered from 0...7, bit number 0 set to 1 represents the value 0x01

Bit value 0 represents function is not supported

Bit value 1 represents function is supported

Spare bits shall be set to zero

One or both of Coordinate and/or Altitude function(s) must be supported.





## **9. PRODUCT IDENTIFICATION**

### **9.1. Marking of conforming products with extensions**

In order to allow users to identify products which conform with the requirements of this extension standard, member companies are encouraged to use the AISG logo on conforming products and on any brochures, advertisements or product literature associated with them. In addition, the legends 'AISG 2.0 (Antenna Line Device Geographic Location Sensor Extension)' or 'Conforms with interface standard AISG 2.0 with Antenna Line Device Geographic Location Sensor Extension ' may be used on such products and associated literature.



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**Annex A: Return codes for GLS device (Normative)**

The return codes listed in [1] ,[6, Annex A] and the return code “NotReady” defined in [8] can be used by AISG GLS.